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CONTENTS

Editorial:

Beauty Belongs to Euclid 128

Original Articles:

The Behavior of Olive Oil and Other Oils with Antimony Trichloride. By Wallace H. Dickhart 131

New Precipitating Agents for Alkaloids and Amines. By Charles C. Fulton (Concluded From February Issue) 134

Pharmacopœias and Pharmacopœia Revisions of the Past 155

Abstracts from, and Reviews of, the Literature of the Sciences Supporting Public Health 169

Book Review 174

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EDITORIAL

On these pages the editor offers his opinions, unshackled by advertising patrons and unrestrained by anything save a sense of the decent and the truthful. The editor, alone, is responsible for their type, their tone and their tenor.

BEAUTY BELONGS TO EUCLID

IN our classroom discussions we have for many years contended that all things of choice beauty and wide acceptability are so because of their elemental and rhythmic arithmetic.

Generally speaking, a wide and prolonged acceptability of anything, be it sculpture, melody, painting, a cup of coffee, a glass of coca-cola, lobster *a la Newburg,* a perfume, cognac, a voice, a form, and indeed all such esthetic entities—means that a deep-hidden arithmetic has somehow worked its magic.

Shakespeare's "Sea Dirge" and everything else he wrote, marks him as an unconsciously consummate mathematician. Michael Angelo's "David," the classic Grecian urn, Corot's willowed landscapes are all of them arithmetical ecstasies, affording universal satisfaction because of their law-abidingness.

But it is an equally sound premise that a chef's well-seasoned scup, Guerlain's Shalimar, the Union League special, and the skin you love to touch, are all of them obedient to kindred basic figures.

Were it not for a certain consonance of organoleptic numbers, how could we explain the otherwise odd partnerships of liver and onions, of sherry with snapper, of corned beef with cabbage, of the martini and olive, and many other such harmonious dietetic and delectable duets!

But who has ever ventured to call corned beef and cabbage beautiful?

Yet beauty does not belong alone to the eye and the ear sense. There is a beauty that belongs exclusively to the touch, a beauty which only the nose knows, and a beauty too, whose awareness comes but to the taste sense.

In extension of the foregoing remarks we print herewith some excerpts in kindred, though more erudite vein, from an article culled

from Industrial Bulletin,* a publication whose greatest fault is that it is a four and not a forty pager.

"Professor George D. Birkhoff, of Harvard University, in his book entitled 'Aesthetic Measure,' sets forth a general formula for measuring the degree of satisfaction or enjoyment one should experience on looking at various shapes and designs, or on hearing particular poetry or music. Among artists, poets and musicians, there have always been those who had a keen instinctive understanding of the possibilities of their art and of how to bring out works of great beauty and satisfaction, and a few who could write about their feelings. The old Greeks gave much thought to line and figure, and developed philosophies of beauty. Professor Birkhoff, while giving thought to the esthetic appraisal of music, perceived from the many writings of the past a general principle, stated it mathematically, and then set about to test the formula to see that it had merit and reasonableness. The formula is simple and far-reaching, although still, perhaps, far from complete and from general acceptance.

The fundamental thought developed is that the more one perceives for a given perceptive effort, the greater is the satisfaction that may be had. For sight, this implies that no matter how quickly it operates, the eye must scan anything it sees, in detail, somewhat as does the inconoscope of television, and that the more complex is the object, the greater is the effort or work required for its perception. Thus regular figures, with repetition of line and angle, are easier to take in or perceive than are irregular or skewed figures, and in a drawing a few important lines are more effective than much fussy detail. There are also, of course, degrees of content of interest among figures. The formula takes into account all of the above, and expresses the artist Hemsterhuis' rule that a 'beautiful form is that which gives us the greatest number of ideas in the shortest space of time.' It expresses mathematically the application of *efficiency* to perception of our senses.

The fundamental formula is $M = \frac{o}{c}$, where M is the measure of satisfaction, o is the 'order' of interest, and c is the measure of complexity that must be overcome in order to perceive the sight or sound. While at first this seems too simple and mechanical possibly to represent satisfaction, students of the subject claim that it wears well on

*Arthur D. Little, Inc.

acquaintance. Such criticism as has already appeared has been to add terms to the formula to include particular or habitual symbols of pleasure. In the book, simple plain figures are analyzed for their intrinsic interest, and a theory of design is worked out, based on the formula, and a method is given for designing beautiful vases. The principle is then applied to music, and melodies are analyzed for interest. The treatment appears to have application to anything seen, heard, or otherwise expressed, to all entities capable of spatial or numerical representation."

Edna St. Vincent Millay that tiffanist of tense and crystallant of sense said the same thing in very few words—thus

"Beauty belongs to Euclid bare."

IVOR GRIFFITH.

Etching Solutions for Microscopic Examination of Metals

A number of glycerin-containing metal-etching solutions of interest to everyone in the metallurgical field are presented by Dr. B. Egeberg and N. E. Promisel in a recent article in *Metal Industry*.

For etching aluminum and its alloys, these authorities recommend that the freshly polished, cleaned specimens be warmed in hot water and treated immediately with the following etchant:

Nitric acid	1 vol.
Hydrofluoric acid	2 vol.
Glycerin	3 vol.

White metals such as tin, lead, antimony, bismuth and their alloys, as well as Britannia metal, may be etched with the following solution:

Nitric acid	1 vol.
Acetic acid	3 vol.
Glycerin	15 vol.

After proper etching, the specimens are, in all cases, rinsed in hot running water and dried in an air blast.

ORIGINAL ARTICLES

THE BEHAVIOR OF OLIVE OIL AND OTHER OILS WITH ANTIMONY TRICHLORIDE

By Wallace H. Dickhart*

THE behavior of antimony trichloride with olive oil and other oils, is very interesting and produces, under certain conditions, various color reactions. It has been found that it will produce a blue color with vitamin "A," synthetic vitamin "A" and various carotenoids and other sterols such as cholesterol, squalene and the carotenes.

Olive oil and palm, both being fruit oils, are similar in producing a blue color, while the other oil colors, with few exceptions, range from yellow to red. Therefore to standardize the color reaction, the writer devised a method to produce uniform results. A 33.33 per cent. solution of the antimony trichloride was made with C. P. chloroform, to 1 cc. of this solution was added 2 grams (approximately fifty drops) of oil, the mixture shaken and permitted to stand one hour, after which the color was observed and read by the Lovibond color method. The following colors were obtained:

Virgin Olive Oil

Greek (heavy)	Emerald green color
Greek (extra)	Pea green color
Spanish	Emerald green color
Italian	Emerald green color
Tunisian	Emerald green color
Sicilian	Emerald green color
Portugese	Emerald green color
French	Emerald green to blue
California	Blue green to blue

Refined Olive Oil

Greek	Blue color
Spanish	Blue color
Italian	Blue color
Tunisian	Blue color
California	Blue color
Extracted ref. foots	Olive green color

* Official chemist for the Olive Oil Association and New York Mercantile Exchange.

Unsaponifiable matter from virgin olive oil, red turning to blue.
Unsaponifiable matter from refined olive oil, red.

The above olive oils were either sent to me by mail or handed personally to me and claimed to be authentic.

Other Oils

Palm (ref.)	Blue color
Palm (crude)	Blue color
Codliver	Blue color to olive green
Butter fat	Blue color
Extract from carrots (P. E.)	Blue color
Cottonseed oil (ref.)	Pink color
Peanut (ref.)	Yellow color
Corn (ref.)	Orange color
Teaseed oil (ref.)	Orange with fluorescence
Domestic soya bean	Mustard color
Sesame (ref.)	Yellow color
Poppyseed	Light pink color
Walnut	Dark brown color
Sunflowerseed	Pink color
Mustardseed oil (black)	Brownish yellow color
Cocoanut oil	Red color
Palm kernel	Red color
Almond (U. S. P.)	Pink color
Kapock (ref.)	Yellow color
Cumari (extracted)	Yellow color
Cumari (crude)	Milky color
Shea	Red color
Oleic acid	Red color
Stearic acid	Red color
Oiticica	Red color
Chinawood	Red color
Lumbang	Yellow to dark red
Oleo stearine	Pink to light red
Hydrogenated olive oil	Light yellow color
Hydrogenated cottonseed	Light pink color
Hydrogenated soya bean	Orange color
Hydrogenated fish	Deep purple color

Hydrogenated Japan fish	Deep purple color
Linseed oil	Brown color
Perilla	Yellow to pale pea green
Glycerine	Negative
Mineral (white)	Negative
Lard	Pink color
White mustardseed	Green to pale green

A refined olive oil, which gave a blue color, was heated to 220 degrees C. for twenty minutes and then tested, producing an amber color.

The above data seems to indicate that olive oil contains one or more of the lipochromes, as they are destroyed by oxidation, reduction, high temperatures and excessive exposure to daylight. If this is true, then we should naturally presume olive oil to contain either vitamin "A" or to possess a substance which, when absorbed into the body would be converted into vitamin "A" by the liver.

The green color formed by the antimony trichloride is probably due to B-carotene or a mixture of a yellow pigment with the blue color from a-carotene, y-carotene or squalene, etc.

The above method might be of value in differentiating, between normal olive oil and teaseed oil, hydrogenated fish oil and hydrogenated cottonseed oil and oiticica and chinawood oils from those of lumbank, perilla and linseed oil. Oiticica and chinawood oils congeal immediately into a rubberlike substance.

As I have only scratched the surface of this important research, more experiments will be conducted and the data assembled for further references.

NEW PRECIPITATING AGENTS FOR ALKALOIDS AND AMINES

By Charles C. Fulton

Associate Chemist, Alcohol Tax Unit Laboratory, U. S. Internal Revenue Bureau
Saint Paul, Minnesota

(Concluded From February Issue)

X. Thiocyanates

Reinecke's salt, $NH_4(NH_3)_2Cr(SCN)_4$, which has often been recommended by others, is indeed a remarkable reagent, excelling any other thiocyanate both in precipitating power and in forming crystalline compounds. It makes one wonder what other similar precipitating agents may exist. Only the fact that the aqueous solution does not keep prevents its having a wider use.

In the writer's "Identification of Cocaine and Novocaine" (2) precipitation tables were given in which reagents yielding crystals were underlined. Reinecke's salt was not underlined but should have been, for in fact it gives crystals with both cocaine and novocaine. The novocaine test will sometimes be of value; the crystals are small but with a fresh solution of the salt are easily obtained and the test quite sensitive.

Ordinary chromium sodium thiocyanate, probably $NaCr(SCN)_4$, is also here added to the list of reagents. It is an effective precipitant, but like most thiocyanates does not give many crystals.

XI. Nitrites

No new nitrites are added, the writer having been unable to try the diammine cobalti-nitrite recommended by Rosenthaler, $K(NH_3)_2$-$Co(NO_2)_4$ (21).

Mercuric sodium chloro-nitrite is now classified in the following group.

XII. Double Halides and Pseudohalides

This new class of reagents is as yet limited to compounds of mercury, although it is just possible that some of the platinum or gold reagents, which are made from chlorides, really belong to it.

The Group E double salts may be regarded as containing a "precipitating component" and a "dissolving component." Thus

Mayer's reagent has HgI_2 as the precipitating component and KI as dissolving component. The latter not only dissolves the insoluble HgI_2 but has a solvent action on the alkaloidal compounds too, if present in excess. The reagent is most sensitive when saturated with the precipitating component, if it is insoluble; or, if soluble, when enough of it is present to combine with all of the dissolving component.

In group XII the precpitating component is a halide or pseudo-halide salt of a central metal, the dissolving component is a different halide salt of an alkali metal (or a halogen acid). The precipitating component is formed by the more effective, more insoluble halide of the two present. Thus sodium mercuric chlori-bromide, Na_2HgCl_2-Br_2 is best written $HgBr_2.2NaCl$, and is the same whether made from $HgBr_2$ plus 2NaCl or $HgCl_2$ plus 2NaBr. However, the reagents should be made from the actual precipitating component. For example, potassium mercuric cyani-iodide is $HgI_2.KCN$. If a reagent is made from $Hg(CN)_2$ by adding KI, there is no way of getting rid of the excess cyanide; we get ($HgI_2.KCN$ plus KCN) as the most sensitive form obtainable, but far less sensitive than a solution of KCN saturated with HgI_2.

Group E

Mercuric Halide Complexes

Table of Combinations

Acid, or Sodium Salt						Mercuric Salt
I	SCN	Br	Cl	NO_2	CN	
1	2	3	4	5	6	I
	7	8	9	10	11	SCN
		12	13	14	15	Br
			16	17	18	Cl
				19	20	NO_2
					21	CN

1. $HgI_2.2KI$ is Mayer's reagent; more or less $2HgI_2.3KI$ is present in Valser's and more concentrated reagents. Indispensable.
2. $HgI_2.4NaSCN$ seems to be the proportion with a 5 per cent. NaSCN solution.
3. HgI_2 plus NaBr or HBr—no very definite formula; 40 per cent. HBr will dissolve HgI_2 to $HgI_2.3HBr$, but with dilution more and more HgI_2 is thrown out, until dilute solutions contain a comparatively high ratio of HBr (or NaBr).
4. HgI_2 plus NaCl or HCl—probably no definite formula; not much HgI_2 dissolves. Very valuable reagent.
5. HgI_2 plus $NaNO_2$. Very little HgI_2 dissolves; enough to make the reagent fairly sensitive, but probably not of much importance.
6. $HgI_2.KCN$ or .NaCN (decomposed by more than feeble acidification). Cyanide dissolves HgI_2 even more readily than iodide does. Valuable reagent.
7. $Hg(SCN)_2.2KSCN$—good reagent, sensitive, but does not give crystals readily with very many alkaloids.
8. $Hg(SCN)_2$ plus NaBr. Not studied.
9. $Hg(SCN)_2$ plus NaCl. Not studied.
10. $Hg(SCN)_2$ plus $NaNO_2$. Not studied.
11. $Hg(SCN)_2.NaCN$ is probably the formula of the compound. pound.
12. $HgBr_2.NaBr$ or .HBr, largely; good reagent.
13. $HgBr_2.2NaCl$ or .2HCl, mostly; good reagent generally similar to the preceding.
14. $HgBr_2$ plus $NaNO_2$. Not studied.
15. $HgBr_2.NaCN$ is probably the formula of the compound.
16. $HgCl_2.NaCl$ or .HCl—moderately valuable; more sensitive and more general than $HgCl_2$ alone, which is usually used.
17. $HgCl_2.2NaNO_2$. Somewhat similar to $HgCl_2.NaCl$ and to $Hg(NO_2)_2.2NaNO_2$ but distinct from either. $HgCl_2.NaNO_2$

is nearly the same, but not quite so distinct from $HgCl_2$ or $NaHgCl_3$.

18. $HgCl_2.NaCN$ is the probable combination.

19. $Hg(NO_2)_2.2NaNO_2$ or $.2HNO_2$ (the solution has to be somewhat acid to hold the mercury in solution). Good reagent though not so very general or sensitive.

20. $Hg(NO_2)_2.HCN$—(?)—No combination seems to have much sensitivity or value. Simple $NaNO_2$ at a somewhat higher concentration will do about as well.

21. $Hg(CN)_2.4HCN$—the reagent has to be acid to show its characteristics, as it is less sensitive and general than basic reagents. It is surprisingly stable; of quite limited but definite value.

XIII. Organic Reagents

Picric acid shows again what has been found in so many other cases—that new and valuable reagents may be created by variation of one long well known.

The usual picric acid reagent is a saturated aqueous solution. Although this is only about 1½ per cent., it is simply too concentrated for best results with numerous alkaloids. Therefore, dilute picric acid solution (0.2%) is now introduced as a reagent. Cinchonine is a good example of an alkaloid yielding crystals readily with the dilute solution, with difficulty or not at all with the saturated solution.

For some time the writer has used a half-saturated solution of sodium picrate in preference to picric acid for crystals with heroin. It gives crystals more readily than picric acid with, probably, the majority of alkaloids; and they are often more or less different in form, so that it is a distinct reagent.

Acid in the solution greatly reduces the solubility of picric acid and reduces the sensitivity toward alkaloids even more than is accounted for by this factor. Crystals may form more readily, however, or they may be of a different kind, as occurs with strychnine; the reagent Picric acid and HCl is therefore introduced.

Flavianic acid is a fairly valuable addition to the list of reagents.

It is still true, as was mentioned in 1932, that remarkably few organic reagents are known of much value as amine-precipitants; so few that no sub-grouping is practicable.

CORRECTIONS TO FIRST SERIES OF FORMULAS[1]

9. Ammonium molybdate. By inadvertence the formula of the compound used was given incorrectly. It should be $(NH_4)_6 Mo_7O_{24}.4\ H_2O$, the commercial acid "ammonium molybdate." The formula may be considered as $3[(NH_4)_2\ MoO_4].4\ MoO_3.4\ H_2O$, and it is doubtless to the MoO_3 component that the precipitating action is really due. Molybdic acid (with acetic), formula No. 4 or Molybdic acid (with HNO_3 or HCl), formula No. 5, of this second series, will probably be found better reagents.

14. Phosphomolybdic acid. Reduce the amount of concentrated nitric acid added to preserve a golden-yellow color from 1 cc. to a few drops—not over 10 drops per 100 cc. As commonly available, phosphomolybdic and phosphotungstic acids dissolve readily in water, but give slightly cloudy solutions. These become clear by heating to boiling for a moment.

17. Sodium phosphomolybdate. This may well be dropped from the list.

33. Chloro-palladous acid or "palladium chloride." Reduce the amount of concentrated HCl from 5 cc. to 4 cc. per 5 grams $PdCl_2$; add 96 cc. water; boil under reflux and a clear solution is soon obtained. About 4½ cc. HCl gives H_2PdCl_4, more reduces the sensitivity. Maximum sensitivity is between $PdCl_2.HCl$ and $PdCl_2.2HCl$. Possibly the precipitating compound is $2PdCl_2.3HCl$, but most likely it is H_2PdCl_4 with greatest sensitivity when a little $PdCl_2$ remains uncombined.

46. Mercuric sodium bromide. NaBr solution does not become completely saturated with $HgBr_2$ very readily in the cold. Therefore, change the formula to the following: NaBr-1½ grams, $HgBr_2$-5½ grams, Water-100 cc. Heat to dissolve all the $HgBr_2$; filter hot if not quite clear. Allow to cool (but do not cool below room temperature); leave the solution in contact with the $HgBr_2$ crystals which separate. Not enough $HgBr_2$ remains dissolved to correspond to $NaHgBr_3$, but some of it at least must be in this form.

47. Mercuric sodium chloro-bromide. Probably better made from $HgBr_2$ plus NaCl, rather than $HgCl_2$ plus NaBr, although the formula does seem to correspond most nearly to $HgBr_2.2NaCl$, which could be obtained in either way. See No. 87 in the following series.

53. "Concentrated Mayer's Reagent." Change the name to *Valser's reagent.*

67. Potassium ferrocyanide. Use a 10 per cent. solution acidified just before using. See Nos. 71 and 72 in the following series.

83. Mercuric sodium chloro-nitrite. The original intention was to make neutral $Na_2Hg(NO_2)_4$ from $HgCl_2$, and sufficient $NaNO_2$ was added for this, but the presence of chloride could not be ignored. Therefore, cut the amount of $NaNO_2$, previously given, in half. Revised formula $HgCl_2$-5 gm, $NaNO_2$-2½ gm, Water-100 cc. Forms $HgCl_2.2NaNO_2$ of the class of double halides (division XII).

85. Lead copper sodium nitrite.

86. Lead sodium nitrite.

88. Tannic acid.

89. Tannic acid and sodium acetate.

These four reagents have so little value that it might be better to drop them all from the list, particularly No. 88.

It will probably be better to make up Dragendorff's reagent (Bismuth H Iodide) as required, since it is none too permanent; formulas are given for this purpose below, and may be used instead of formulas 61, 62, and 63 of the first series.

Acidified reagents: In general, when only the neutral form of a reagent has been given, an acidified form may be made by adding 1 drop per cc. of (1 plus 3) H_2SO_4.

REAGENT FORMULAS, SECOND SERIES

The reagents are dissolved in water except as otherwise noted.

I. Basic Reagents

1. *Saturated* Na_2HPO_4 *solution.*

5 per cent. Na_2HPO_4 was included in the previous list, but has such a small reserve of alkalinity that the saturated solution will probably prove of more value.

2. *Borax.*

A 5 per cent. solution of sodium borate, $Na_2B_4O_7.10\ H_2O$. This has less basic strength or alkalinity than Na_2CO_3, but more than K_2CrO_4.

3. *Tri-Sodium Phosphate.*

A 5 per cent. solution of Na_3PO_4. This is about equal to Na_2CO_3 in alkalinity.

II. Simple Oxygen Acids

4. *Molybdic acid (with acetic).*

5 cc of a 5 per cent. sodium molybdate ($Na_2MoO_4.2H_2O$) solution freshly acidified with 0.5 cc. glacial acetic acid. This is similar to acid ammonium molybdate, but perhaps more effective and reliable in action.

5. *Molybdic acid (with* HNO_3 *or* HCl).

5 cc. of a 5 per cent. sodium molybdate solution freshly acidified with 0.2 cc. concentrated HNO_3 or HCl. Similar to the preceding; sometimes a little more sensitive. An excess of the mineral acid (as 0.5 cc. or more) cuts down the sensitivity.

6. *Concentrated Chromic Trioxide.*

CrO_3-20 grams, water-100 cc. A valuable variant of 5 per cent. CrO_3, reagent No. 10 first series.

7. *Chloro-Chromic acid.*

(a) CrO_3-5 gm, Water-75 cc. Concentrated HCl-25 cc. The sensitivity increases with the HCl content, but 25 volumes per cent. is about the maximum possible without oxidation to chlorine occurring. In this proportion the reagent is reasonably stable and will keep for months, slowly becoming darker as the chromium is reduced to $CrCl_3$.

(b) CrO_3-5 gm, NaCl-25 gm, Water-100 cc. This is similar to the preceding, and a little more stable.

This reagent should have the same color as CrO_3. The precipitating agent is doubtless $HCrO_3Cl$. Thus it is a connecting link between this class and the chlorides, but it is classed here as a variant of CrO_3. It is a better precipitant than CrO_3 solution.

III. Complex Oxygen Acids

8. *Yellow Phophomolybdic acid and* HCl.

Phosphomolybdic acid crystals-10 gm, Water-75 cc., Concentrated HCl-25 cc. This is about as much HCl as can be used without changing the character of the reagent.

9. *Phosphomolybdic acid in* HCl.

Phosphomolybdic acid-10 gm, Water-20 cc., Concentrated HCl-80 cc. The phosphomolybdic acid is insoluble in completely concentrated HCl, but will dissolve gradually in this mixture, more readily on heating. Avoid heating so much as to drive off HCl. The solution has a pale yellow color and gives white precipitates with alkaloids.

10. *Stabilized Yellow Phosphomolybdic acid.*

Phosphomolybdic acid-10 grams, Water-90 cc., Concentrated HNO_3-10 cc. Let stand at least 6 weeks, and the solution becomes more stable, so that it is not readily decolorized by H_3PO_4, H_2SO_4, or HCl. It can then be used for the following reagent, No. 11.

11. *Yellow Phosphomolybdic acid and* H_3PO_4 (*or* H_2SO_4).

(a) To 5 cc. of the stabilized yellow phosphomolybdic acid reagent (No. 10) add 0.75 cc. syrupy H_3PO_4 (85%). Mix. The solution must remain yellow for use; it will keep several days. This reagent gives crystals very readily with narceine, similar to those given by yellow arseni-molybdic acid. Crystals also with atropine (needles).

(b) A similar reagent is produced with 1 cc. 87 per cent. H_2SO_4 (8½ cc. concentrated plus 1½ cc. water) added to 5 cc. of reagent No. 10. It does not give crystals as readily with narceine, and they are often more plate-like.

12. *Colorless Phosphomolybdic acid.*

$Na_2MoO_4.2H_2O$-10 gm, H_3PO_4 (syrupy)-10 cc., Water-90 cc. This is not nearly so sensitive or general a precipitant as the yellow reagent.

13. *Yellow Arseni-Molybdic acid.*

(a) $Na_2MoO_4.2H_2O$-10 gm, As_2O_5-0.75 gm, Water-85 cc. Heat to dissolve the As_2O_5, cool and acidify with 15 cc. concentrated HNO_3.

(b) Substitute 15 cc. concentrated HCl for the HNO_3. However, add 2 or 3 drops HNO_3 to preserve the golden-yellow color.

Formula is intended to give maximum depth of yellow color and readiest crystallization with narceine, for which it is one of the best tests. Crystals appear as mossy rosettes of tangled threads, ribbons, and plates.

14. *Colorless Arseni-Molybdic acid.*

$Na_2MoO_4.2H_2O$-10 gm, As_2O_5-8 gm, Water-100 cc. Reflux 2 or 3 hours. The solution is acid from the excess of As_2O_5. It will not become yellow by the addition of HCl or HNO_3. It corresponds more or less to No. 12.

15. *Arseni-Tungstic acid.*

$Na_2WO_4.2H_2O$-10 gm, As_2O_5-8 gm, Water-100 cc. Reflux 2 or 3 hours. This reagent does not correspond to the preceding colorless arseni-molybdic acid (No. 14), but to yellow arseni-molybdic acid (No. 13). It gives crystals with narceine similar to those of No. 13 and is a more general and sensitive precipitant than No. 14.

16. *Phosphotungstic acid aged with* H_3PO_4.

$Na_2WO_4.2H_2O$-20 gm, H_3PO_4-10 cc., Water-90 cc. After standing at least a month this reagent also gives crystals with narceine (though not so very readily), and corresponds more or less to yellow phosphomolybdic acid and H_3PO_4 (No. 11).

17. *Borotungstic acid.* A 10 per cent. solution.

IV. Halogen Reagents

18. *Wagner's No. 9.*

Iodine—1 gm, KI-100 gm, Water-100 cc. Gives excellent crystal tests with pseudomorphine (black rosettes, purple "smudge rosettes," etc.) and nicotine, although Wagner's No. 8 can also be used.

A double strength Wagner's No. 8 (i. e., with Iodine-2 gm, KI-100 gm, Water-100 cc.) is also very good, especially for nicotine.

19. *Wagner's No. 10.*

Iodine-0.15 gm, KI-20 gm, Water-100 cc. Characteristic crystals with sparteine and pseudomorphine (yellow pointed prisms with moderate concentration).

20. *Wagner's No. 11.*

Iodine-0.2 gm, KI-100 gm, Water-100 cc. Generally similar to the preceding. Pseudomorphine (rather concentrated solution in diluted acetic acid) gives yellow prisms and bright purple "smudge rosettes" of amorphous material, a remarkable color-contrast.

21. *Aged Iodine Water.*

Shake iodine crystals with water and let stand, with occasional shaking, for at least a week. Probably really a solution of iodine in very dilute HI. Similar to Iodine-NaBr (reagent No. 30, first series).

22. *Iodine in Concentrated Hydrobromic acid.*

Iodine-3.5 grams, HBr (34%)-100 cc. Let stand, with occasional shaking, until the iodine has dissolved.

23. *Iodine in HBr* (10%).

Iodine-1 gram, HBr (40%)-25 cc. Let stand, with occasional shaking, until the iodine has all dissolved. (This takes several days.) Then add 75 cc. water.

24. *Iodine in Acetic acid.*

Iodine-0.65 gram, glacial acetic acid-65 cc. Let stand, with occasional shaking, until the iodine has all dissolved. (This takes several days.) Then add 35 cc. water. Leave the solution in contact with the excess iodine crystals which separate.

For six I-KI reagents made with strong acids see reference (6). While devised for the identification of traces of morphine by direct application, they can be used for other alkaloids and can be applied to solutions. The subject of I-KI reagents with strong acids for the alkaloids in general must still be studied. Of the six mentioned, probably some need not be retained; on the other hand they do not cover the whole range.

V. Simple Halides

25. *Concentrated Potassium Iodide.*

KI-50 grams, water-100 cc.

26. *Concentrated Sodium Thiocyanate.*

NaSCN-50 grams, water-100 cc.

27. *Concentrated Sodium Nitrite.*

$NaNO_2$ (granulated)-50 grams, water-100 cc.

VI. Chlorides

28. *Concentrated Ferric Chloride.*

$FeCl_3$-50 gm, Water-50 cc.

Dilute $FeCl_3$ (5%) has practically no value, but this reagent is useful. Its effect is generally similar to that of $FeCl_3$ in Concentrated HCl (No. 45, first series).

29. *Ruthenium H Cloride.* (Chloro-ruthenic acid.)

$RuCl_3$-5 gm, Water-94 cc., Concd. HCl-6 cc. Warm to obtain solution.

This corresponds to H_3RuCl_6, which is probably the precipitating compound, although the sensitivity does not vary much with the HCl. This is not a very sensitive nor a very general reagent; it corresponds more closely to $FeCl_3$ in HCl than to anything else.

30. *Palladous H Chloride and HCl.*

$PdCl_2$-5 gm, Concd. HCl-20 cc., Water-80 cc.

31. *Platinic H Chloride and HCl.*

H_2PtCl_6 crystals-5 gm, Concd. HCl-20 cc., Water-80 cc.

32. *Platinous K Chloride.*

K_2PtCl_4 crystals-5 gm, Water-100 cc. This solution is red.

Not as effective as the platinic acid (H_2PtCl_6, No. 32, first series).

33. *Gold H Chloride and HCl.*

$HAuCl_4$ crystals-5 gm, Concd. HCl-25 cc., Water-75 cc.

A very valuable reagent; first developed for crystals with novocaine.

34. *Gold H Chloride in concentrated HCl.*

$HAuCl_4$ crystals-5 gm, Concd. HCl-100 cc.

A valuable reagent with innumerable uses; first developed for heroin (applied to the aqueous solution).

35. *Gold H Chloride in Sulfuric acid.*

$HAuCl_4$ crystals-5 gm, H_2SO_4 (1 plus 1)-100 cc.

This is an even better reagent for heroin than the preceding.

36. *Gold H Chloride in Syrupy* H_3PO_4.

$HAuCl_4$ crystals-5 gm, syrupy H_3PO_4 (85%)-100 cc.

37. *Gold H Chloride in Glacial Acetic acid.*

$HAuCl_4$ crystals-5 gm, Glacial Acetic acid-100 cc.

VII. Bromides

28. *Palladous H Bromide.*

(a) $Pd(NO_3)_2$-5 gm, Water-85 cc., HBr (34%)-15¾ to 16 cc. (Add just enough HBr to obtain solution.)

(b) $PdCl_2$-5 gm, Water-96 cc., Concd. HNO_3-3.6 cc., NaBr-11.5 gm. Precipitating agent apparently H_2PdBr_4.

39. *Palladous H Bromide and HCl.*

$PdCl_2$-5 gm, NaBr-11.5 gm, Water-75 cc., Concd. HCl-25 cc.

40. *Palladous Bromide and NaBr.*

$Pd(NO_3)_2$-5 gm, NaBr-50 gm, Water-100 cc., HBr (40%)-0.5 cc.

This seems to be the best of the above three reagents for crystals.

Thus far palladium bromide reagents have been very disappointing, in marked contrast to the platinic and gold bromides.

41. *Platinic H Bromide and HCl.*

H_2PtCl_6 crystals-5 gm, HBr (40%)-8½ cc., Water-75 cc., Concd. HCl-16½ cc.

42. *Platinic H Bromide in Concentrated HCl.*

H_2PtCl_6 crystals-5 gm, HBr (40%)-8½ cc., Concd. HCl-91½ cc.

43. *Platinic H Bromide in Sulfuric acid.*

H_2PtCl_6 crystals-5 gm, HBr (40%)-8½ cc., H_2SO_4 (2 plus 3)-91½ cc.

44. *Platinic H Bromide in Syrupy* H_3PO_4.

H_2PtCl_6 crystals-5 gm, HBr (40%)-8½ cc., H_3PO_4 (85%)-91½ cc.

The platinic bromide reagents are absolutely indispensable.

45. *Platinous H Bromide.*

K_2PtCl_4-5 gm, HBr (34%)-10 cc., Water-90 cc. Treat the powdered crystals with the HBr, then add about 15 cc. of the water. Warm slightly. Solution is obtained and the bromide formed. Add the rest of the water. Further warming, or standing for a considerable time may be necessary for complete conversion of the compound to bromide. Similar to the chloride but somewhat more sensitive; still inferior to platinic chloride.

46. *Gold H Bromide and HCl.*

$HAuCl_4$ crystals-5 gm, NaBr-5 gm, Water-75 cc., Concd. HCl-25 cc. May also be made with HBr.

47. *Gold H Bromide in Concentrated HCl.*

$HAuCl_4$ crystals-5 gm, HBr (40%)-7½ cc., Concd. HCl-92½ cc. May also be made with NaBr. An invaluable reagent giving crystals with most alkaloids. Developed for heroin (applied to the aqueous solution); and for morphine, with which it gives two kinds of crystals, one when applied to the aqueous solution, one in concentrated HCl test drop.

48. *Gold H Bromide in HBr.*

$HAuCl_4$ crystals-5 gm, HBr (40%)-100 cc. This is very similar to the preceding reagent.

49. *Gold H Bromide in Sulfuric acid.*

$HAuCl_4$ crystals-5 gm, HBr (40%)-7½ cc., H_2SO_4 (2 plus 3)-92½ cc. Perhaps the best of all reagents for heroin (for application to the aqueous solution).

50. *Gold H Bromide in Syrupy* H_3PO_4.

$HAuCl_4$ crystals-5 gm, HBr (40%)-7½ cc., H_3PO_4 (85%)-92½ cc. In a syrupy H_3PO_4 test drop, this will precipitate all amines.

51. *Gold H Bromide in Glacial Acetic acid.*

$HAuCl_4$ crystals-5 gm, HBr (40%)-7½ cc., Glacial acetic acid-92½ cc.

There are no reagents more valuable than the gold bromide reagents.

52. *Zinc sodium Bromide.*

$ZnSO_4$-10 gm, NaBr-60 cc., Water-100 cc.

53. *Zinc Hydrobromic acid.*

Zinc (granulated)-7 grams, HBr (34%)-100 cc. (40% HBr may be used about equally well.)

54. *Simple Mercuric Bromide.*

A saturated solution of $HgBr_2$ in water. (According to Treadwell-Hall the solubility is 0.6 grams per 100 cc.)

55. *Bromo-Mercuric acid.*

HBr (40%)-3½ cc., Water-96½ cc. Saturate with $HgBr_2$. This will require about 5 grams. The compound formed is probably mostly $HgBr_2.HBr$.

56. *Mercuric H Bromide and HBr.*

$HgBr_2$-5 gm, HBr (34%)-25 cc., Water-75 cc.

57. *Mercuric H Bromide and HCl.*

$HgBr_2$-5 gm, HBr (40%)-4 cc., Concd. HCl-20 cc., Water-76 cc.

58. *Mercuric Na Bromide and NaBr.*

$HgBr_2$-5 gm, NaBr-20 gm, Water-100 cc.

59. *Stannous H Bromide with HCl.*

NaBr-4½ gm, $SnCl_2$ solution-10 cc. ($SnCl_2$ solution: Tin-3 gm, Concd. HCl-25 cc.; when solution is complete add 75 cc. water and a little extra tin.)

60. *Stannous Hydrobromic acid.*

Tin-5 gm, HBr (40%)-65 cc. When the tin is dissolved add 35 cc. water and mix; then add 5 gm additional tin, and store in a cool place. The 40 per cent. HBr should constitute 60 to 80 per cent. of the reagent for maximum sensitivity. Tin dissolves only quite slowly in HBr of less than 40 per cent. strength, so that the reagent will keep for a long time, especially if stored in the refrigerator. It should prove useful for a variety of purposes for which stannous chloride is generally used.

61. *Stannic Hydrobromic acid.*

Dissolve 7 gm. tin as completely as possible (by allowing to stand at room temperature for 3 or 4 days) in 100 cc. 40 per cent. HBr. Then add 3 cc. bromine, and let stand. In a week or so the solution is a deep plum red. This reagent has only about the sensitivity of stannic chloride, and does not give crystals as readily with the alkaloids tried; it is far inferior to stannous hydrobromic acid.

VIII. Iodides

62. *Concentrated Valser reagent.*

HgI_2-100 gm, KI-65 gm, Water-100 cc. About 55 gm. KI will dissolve the HgI_2, but the 10 gm. "excess" is necessary to hold it in solution in the usual test-drop. 100 gm. HgI_2 to 55 gm. KI corresponds to $2HgI_2.3KI$; 73 gms. KI would be needed to make $HgI_2.2KI$.

63. *Nessler's No. 1.*

KI-5 gm, Water-100 cc., HgO to saturate (or add 1.6 grams). This corresponds to Mayer's reagent in Hg content.

64. *Nessler's No. 2.*

KI-12½ gm, Water-100 cc., HgO to saturate, or add 4.1 gm. A Valser reagent with 1 per cent. NaOH will give nearly the same results as this solution.

65. *Nessler's No. 3.*

HgO-12 gm, KI-36.8 to 37 gm, Water-100 cc.

66. *Nessler's No. 4.*

HgO-50 gm, KI-153 to 155 gm, Water-100 cc.

67. *Alkaline Valser reagent.*

KI-10 gm, HgI_2-15 gm, Water-70 cc., 10 per cent. NaOH solution-30 cc. This gives characteristic results by its excess alkalinity; if the NaOH content is reduced to 1 per cent. it becomes nearly the same as Nessler's No. 2.

68. *Alkaline Concentrated Valser reagent.*

HgI_2-100 gm, KI-65 gm, Water-75 cc., 10 per cent. NaOH solution-25 cc.

The above six reagents are of great value for crystals with atropine and hyoscyamine. The different forms of these crystals were

used to determine the varieties of the reagent. The two alkaloids, although optical isomers, are easily distinguished, particularly by Nessler's No. 2 or the Alkaline Concentrated Valser reagent.

69. *Dragendorff reagents.*

Concentrated Bismuth Nitrate stock solution: Bismuth subnitrate-50 gm, HNO_3 (1 plus 1)-70 cc.; after solution add water to make 100 cc.

The principal Dragendorff reagents given in the preceding article are made from this as follows:

(a) *Standard Dragendorff.* KI-2½ gm, Water-9 cc., Concd. $Bi(NO_3)_3$ soln.-1 cc.

(b) *Double Strength Dragendorff.* KI-4½ gm, Water-8 cc., Concd. $Bi(NO_3)_3$ soln.-2 cc.

(c) *Strongly Acid Dragendorff.* KI-2¼ gm, Water-4 cc., H_2SO_4 (1 plus 3)-5 cc., Concd. $Bi(NO_3)_3$ soln.-1 cc.

(d) *Dragendorff and KI.* KI-10 gm, Water-9 cc., Concd. $Bi(NO_3)_3$ soln.-1 cc.

70. *Concentrated Dragendorff reagent.*

KI-10 gm, Concd. $Bi(NO_3)_3$ soln. (given above)-5 cc., Water-5 cc. Shake; then filter off the precipitated KNO_3.

IX. Cyanides

71. *Hydroferrocyanic acid with* H_3PO_4.

7 cc. 10 per cent. potassium ferrocyanide solution plus ½ cc. syrupy H_3PO_4.

Gives crystals readily with cinchonine and cinchonidine.

(Potassium ferrocyanide solution: 10 gm. $K_4Fe(CN)_6.3H_2O$ in 100 cc. water.)

72. *Hydroferrocyanic acid with* H_2SO_4 *or* HCl.

(a) 8 cc. 10 per cent. potassium ferrocyanide solution plus ½ cc. H_2SO_4 (1 plus 3).

(b) 5½ cc. 10 per cent. potassium ferrocyanide solution plus ½ cc. HCl (1 plus 1).

This reagent does not crystallize readily with cinchonidine, although the cinchonine crystals are the same as with No. 71.

73. *Platinous K Cyanide.*

A 5 per cent. solution of $K_2Pt(CN)_4$.

This gives crystals readily with various alkaloids but is not as sensitive nor as valuable as the platinic cyanide reagent given in the preceding article.

74. *Mercuric H Cyanide.*

$Hg(CN)_2$-5 gm, NaCN-3½ gm, Water-96 cc. Under hood, cautiously add glacial acetic acid-3½ cc. Use with caution. Apparently the compound formed is $H_4Hg(CN)_6$.

X. Thiocyanates

75. *Reinecke's Salt.*

Ammonium diammine chromium thiocyanate, $NH_4(NH_3)_2$-$Cr(SCN)_4$. This can be obtained commercially. The reagent is a freshly prepared approximately saturated solution.

Directions for making the salt have been given by Morrow and Sandstrom (22).

76. *Chromium Na Thiocyanate.*

(a) $Cr_2(SO_4)_3$ crystals-3 gm, NaSCN-10 gm, Water-15 cc. Heat on the water bath for an hour or so. A deep violet solution is obtained. Add 85 cc. water.

(b) CrO_3-4 gm, Water-20 cc. Add 20 gm. NaSCN to the solution. A reaction takes place with evolution of heat. Let stand until cool, then add 80 cc. water. The solution is dark brown.

In spite of the difference in color (the crystals formed, as well as the solution, are brown instead of violet as with the preceding formula), this seems to be essentially the same reagent as (a).

XI. Nitrites

No new nitrites are added.

XII. Double Halides and Pseudohalides

77. *Mercuric iodide and HBr.*

HBr (40%)-5 cc., Water-95 cc., HgI_2—to saturate (this requires only about 1 gram).

78. *Mercuric iodide and NaBr.*

NaBr-5 gm, Water-100 cc., HgI_2—to saturate (add about 2 grams).

79. *Mercuric iodide in strong NaBr solution.*

HgI_2-3 gm, NaBr-60 gm, Water-100 cc.

80. *Mercuric iodide and HCl.*

Concd. HCl-27 cc., Water-73 cc., HgI_2—to saturate. The solution does not take up very much HgI_2. The HCl content is here 10 per cent. by weight, but it can be varied considerably with little change in the properties of the reagent—even to using concentrated HCl as reagent solvent. The solution is colorless, but gradually turns yellow. This seems to affect its properties little if any. This is a reagent of great value, for instance in the identification of heroin (3).

It may be applied to the aqueous solution, or with even greater sensitivity directly to the solid alkaloid or its salt.

81. *Mercuric iodide and NaCl.*

NaCl-30 gm, Water-100 cc., HgI_2—to saturate.

82. *Mercuric K Cyani-Iodide.*

KCN-0.7 gm, Water-100 cc., HgI_2—to saturate (4½ grams). This is a sensitive and valuable reagent. The compound formed apparently is $HgI_2.KCN$, the KCN used having about 85 per cent. of the theoretical dissolving power. NaCN-0.5 gm. can be substituted.

83. *Mercuric cyanide and NaI.*

$Hg(CN)_2$-4 gm, NaI-4½ gm, Water-100 cc. This is the most sensitive reagent that can be made with $Hg(CN)_2$ by adding iodide, but is not nearly as sensitive as the preceding. The formula $Hg(CN)_2 + 2$ NaI is really equivalent to $HgI_2.NaCN + NaCN$. The excess NaCN not only reduces the sensitivity, but changes the crystallizing effects.

84. *Mercuric Na Cyani-Iodide and NaI.*

HgI_2-4½ gm, NaCN-0.5 gm, Water-100 cc. Shake; filter; then add 8 gm. NaI.

85. *Mercuric K Cyani-Iodide and KI.*

HgI_2-4½ gm, KCN-0.7 gm, Water-100 cc. Shake; filter; then add 9 gm. KI. In general sodium and potassium salts give identical results, but this reagent and the preceding give entirely different crystals, with codeine at any rate.

86. *Brom-Chloro Mercuric acid.*

$HgBr_2$-5 gm, Concd. HCl-1.75 to 2 cc., Water-98 cc.

87. *Mercuric Na Chloro-Bromide.*

$HgBr_2$-5 gm, NaCl-1.25 to 1.40 gm, Water-100 cc. Bring the compounds into solution by heating. The minimum NaCl corresponds to 2 $HgBr_2.3NaCl$, but the solution will probably precipitate some $HgBr_2$ on standing after cooling. It is possible that the compound in solution is actually $HgBr_2.2NaCl$, allowing for uncombined soluble $HgBr_2$.

88. *Mercuric bromide and HCl.*

$HgBr_2$-5 gm, Concd. HCl-22 cc., Water-78 cc.

Mercuric Na Chloro-Nitrite. See No. 83 under "Corrections to First Series of Formulas."

Numerous other double halides are possible, but their value, if any, is still unknown, and even those given above have been insufficiently studied.

XIII. Organic Reagents

89. *Dilute Picric acid solution.*

Picric acid crystals (10% water)-0.2 gram, Water-100 cc.

90. *Half-saturated Sodium Picrate.*

Separate a saturated solution of sodium picrate from excess crystals and dilute with an equal volume of water. (Sodium picrate may be precipitated from picric acid solution by adding concentrated sodium acetate.)

91. *Picric acid in dilute HCl.*

Saturated aqeuous picric acid solution-30 cc., Water-65 cc., Concentrated HCl-5 cc. Some of the picric acid is thrown out of solution, as its solubility is greatly reduced by the acid.

92. *Trinitroresorcin.*

A saturated solution. The compound can be made by treating resorcin with concentrated HNO_3 and recrystallizing from water. Results with reagent similar to those with saturated picric acid.

93. *Flavianic acid.*

(a) Napthol Yellow S-5 gm, Water-80 cc., 1 n H_2SO_4-20 cc.

(b) Directions for making the compound are given by Morrow and Sandstrom (22).

Summary

1. The present article is a continuation and extension of "The Precipitating Agents for Alkaloids," 1932.

2. "Precipitation from Acids" discusses the new developments in the use of strong acids in the test drop. Phosphoric acid has particular importance, as in it the alkaloidal precipitates reach their maximum insolubility. In a test drop of syrupy phosphoric acid certain compounds will precipitate all amines.

3. With the use of strong acids as reagent-solvents, the method of obtaining crystal tests by adding the reagent directly to the solid alkaloid or its salt becomes of great importance and value. (The rest of the article, however, is concerned primarily with reagents to be added to solutions of the alkaloids).

4. A classification of the reagents into 5 groups or 13 subgroups is given, followed by a discussion of new reagents. Particular attention is given to complex oxygen acids, Nessler's and related reagents, double halides and pseudohalides.

5. A few corrections to the first series of formulas are given, and the dropping of a few of the former reagents is suggested.

6. Ninety-three reagent formulas are given. A few of these represent long-known reagents which merely escaped inclusion in the preceding article; some others have been published by the writer in connection with specific uses, but the majority are entirely new. Most expanded (in number of formulas added) is the class of bromides, which now contains some of the most valuable reagents known.

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PHARMACOPOEIAS AND PHARMACOPOEIA REVISIONS OF THE PAST*

THE evolution of the art of compounding medicines and of standardizing pharmaceutical preparations has its beginnings in the remote past. More than a score of nations now have pharmacopœias in the national or geographic sense.

A little more than a century ago, there were more than twice as many pharmacopœias as there are today, for the London, Edinburgh and Dublin Pharmacopœias had not yet been consolidated into the present British Pharmacopœia, and there were literally dozens of pharmacopœias in Europe, especially in the Teutonic countries where similar consolidations had not yet been effected.

Three centuries ago, the pharmacopœia as an authorized work of standard formulas and identified simples was a novelty and there were not more than a half dozen of importance.

Formularies, antidotaries, receipt books and dispensatories there had been for many centuries, but none of these were issued with the stamp and seal of any national, state or municipal authority until within the first century after the invention of printing by movable type.

There is an unverified tradition that Imhotep, the medical demigod of ancient Egypt, was the author of a collection of medical recipes in about 3000 B. C. and according to one of the authorities on ancient Babylonia there were physicians and pharmacists as separate practitioners in that country as early as 4000 B. C., but the first real landmark in the search for ancient formularies is the Ebers Papyrus which dates from 1552 B. C.

This is a priestly formulary containing hundreds of receipts for remedies for specific complaints, and including in all about 700 simple drugs belonging to the animal, vegetable and mineral kingdoms. Many of the drugs mentioned in this ancient document are in use today.

This is also true of the drugs used in Assyria during the first millenium B. C., as recorded upon clay tablets recovered from the site of ancient Nineveh.

† Prepared by the late Dean Charles H. LaWall, this article, not before appearing in print, is of significant interest, in view of the Pharmacopœial Convention, held at Washington, May, 1940.

The Hebrews contributed little or nothing to this branch of knowledge so we must turn to ancient Greece, Alexandria and Rome for the continuation of the story.

Hippocrates neither compiled a formulary nor had access to one so far as we know, but in his writings he refers to more than 200 different drugs and preparations in his discussion of diseases and their treatments.

Dioscorides was the author of a materia medica, as it would be called today but his well known work was preceded by an illustrated manuscript on the same subject by Krateuas who lived in the reign of Mithridates VI, Eupator, in the second century B. C. Dioscorides' work was better known, however, and was the undisputed authority on the subject for nearly 1500 years.

The first Roman to compile a formulary was Scribonius Largus, an army surgeon who was physician to the Emperor Claudius and accompanied him to Britain. This work which disappeared about 45 B. C., was called "Compositiones" and was the first on record of a long line of individually compiled and privately issued works which were the forerunners of the first real pharmacopœias of the fifteenth, sixteenth and seventeenth centuries.

In Scribonius Largus' book, opium is first described as to its source and method of preparation and is distinguished from meconium which was an extract made from the whole poppy plant. Contrary to the statements of a number of authorities opium is not mentioned in the Ebers Papyrus although poppy heads and poppy seeds are frequently referred to.

Galen mentions many drugs and originated a number of preparations, of which the most famous is our well known cold cream, but none of his numerous books can be really called a formularly, although one of his works discussed simple remedies and another compound medicines which, however, were not in tabulated form and were arranged in the order of the diseases for which they were recommended. Galen was familiar with nearly 500 simple drugs, and he used infusions and decoctions, troches, pills, electuaries, cerates, ointments and plasters, all of which, however, were classes of preparations that had been known to the ancient Egyptians.

Vinegars and wines came into use during the Alexandrian and Roman periods while syrups, juleps and many other saccharine classes of preparations were introduced by noted authorities during the Arabian period.

Following the downfall of Rome all culture and learning fell into the hands of scholars who used Arabic as a medium of expression. These were not all Mohammedans but included Jews, Persians and Nestorian Christians.

Among these were some noted characters who compiled formularies which were to have a great influence upon the later development of this field.

One of these authorities was Mesue Sr. who was chief physician of the medical academy of Bagdad in the golden days of Harun Al Rashid, in about 780 A. D. Mesue was the son of a pharmacist and was the reputed author of a formulary of medicinal preparations as well as a treatise on dentifrices.

Under the Mohammedan culture schools of pharmacy were established in connection with schools of medicine in many centers of learning.

Another authority of note was Rhazes who was the acknowledged leader of medical and pharmaceutical thought in the Eastern Caliphate a century after Mesue. The Antidotarium of Rhazes was responsible for the introduction of syrups, juleps, honeys, condits, conserves and other saccharine preparations, in the avowed effort to make medicines more palatable. In this formulary mention is made for the first time of a number of drugs which were widely used in later centuries.

Among these were brandy, camphor, musk, nutmeg, mace, cardamom, cubeb, senna and nux vomica.

Mesue, Jr., and Avicenna were other contributors to the list of formularies. The former wrote a work known as the "Grabadin" a corruption of the Arabic "Al acrabadin" which means compound medicines. This work was arranged in chapters each of which dealt with a different class of preparations. These were confections, juleps, potions, decoctions, infusions, electuaries, opiates, purgatives, pills, troches, powders, oils, ointments, cerates and plasters. This work was the basis of a number of formularies which were in use in practically every pharmacy in Europe during the medieval period which lasted until about 1500, and it is this Mesue whose name is attached to so many formulas in the pharmacopœias of the sixteenth, seventeenth and eighteenth centuries.

Avicenna, the Prince of Physicians, as he was called, was another prolific author and in his "Antidotarium" the gilding and silvering of pills was described and recommended for the therapeutic as well as the ornamental effect. Two other Arabian authorities of lesser im-

portance were Serapion, Jr., who compiled a treatise on drugs in the eleventh century in which nearly 500 drugs were described, and Albucasis, to whom surgery owes the introduction of the cautery, wrote the *Liber Servitorius* in which are described many chemical processes and chemical substances prepared by distillation and sublimation, which probably dated from the time of Geber, in the ninth century, the latter having been the father of alchemy. Serapion and Albucasis were both of the western caliphate which had its headquarters in Spain.

The most complete work in Arabian materia medica was contributed by Baytar, also in the eleventh century. In this work more than 2000 articles were discussed, it really being a review of drugs from the time of Dioscorides to his own time and is particularly noted for its containing a detailed account of cannabis indica and its cultivation.

The great medical school at Salerno was so famous for its medical learning that it was known as the Hippocratic City in the twelfth century. Here was compiled by a group of leaders an "Antidotarium" which is assumed to be the one attributed to Nicholas Prepositus who was director of the school in the beginning of the twelfth century. This Nicholas who was sometimes known as Nicholas Salernitatis, or Nicholas Salerno, to distinguish him from Nicholas Florentini and Nicholas Alexandrini who were also quoted frequently in pharmacopœias of the sixteenth and seventeenth centuries, was the most frequently quoted author next to Mesue, Jr.

The Antidotary of Nicholas Prepositus is essentially a work for pharmacists in the manner of presentation of its subject matter as it consists mainly of drug descriptions and directions for making simple and complex preparations, with little or no reference to therapeutic properties.

Another link in the chain was the *"Liber de Simplici Medicina"* written by Matthaeus de Platearius in the middle of the twelfth century. This same author wrote a commentary on the *Antidotarium* of Nicholas Prepositus which helped to perpetuate the latter work.

The last great item in the list of manuscript formularies which appeared before the era of printing was the *"Compendium Aromatiorum"* of Saladin de Asculo of the middle of the fifteenth century.

The first actual pharmacopœia to be compiled by a specially appointed commission was one that appeared in Florence in 1498. This is the only pharmacopœia which was an *"incunabulus"* or a book

printed prior to the year 1500. It was a small volume bearing the ponderous title, *"Nuovo Receptario Composto dal Famossissimo Collegio degli Eximii Doctori della Arte Et Medicina della Inclita Cipta de Firenze."* It was written in Italian and contained formulas from the works of Galen, Mesue, Avicenna, Rhazes, Nicholas Prepositus and others.

This work has never been widely circulated nor published in facsimile so that the reputation of the first pharmacopœia has always been given to the work of *Valerius Cordus,* which will be referred to presently.

This early Florentine work appeared in a revised form in 1567 under the title, *"Ricettario Fiorentino"* in a parchment bound folio. It was revised frequently during the several centuries following and it is of particular interest to know that pharmacists collaborated with physicians in the revisions which appeared under the governments presided over by the *Medici.*

It is in connection with this same work that the word pharmacopœia first appears in literature to designate an official collection of pharmaceutical formulas for the term was used by Johanneum Placotonium in connection with a Latin translation of the first Florentine pharmacopœia, which was published in Antwerp in 1560. (1)

There was still another pharmacopœia which antedated that of Valerius Cordus as recent records show. It was the *"Concordia Pharmacopolorum Barchinonensium"* printed in Barcelona in 1535. This not only consisted of a formulary but it contained drug tariffs and manipulation fees as established by the Barcelona pharmaceutical organization of that period.

We now come to the celebrated work of Valerius Cordus, which has heretofore held the undisputed record for priority as a pharmacopœia.

Valerius Cordus was a physician and the son of a physician. He was graduated at Marburg at the age of sixteen with the baccalaureate

(1) A revised edition of the *"Ricettario Fiorentino,"* published in 1623, is a parchment bound folio, beautifully printed and with a handsome coppel plate engraving for a title page.

The classes of preparations represented in this book are as follows: Aceta, Aquae, Cerota (Cerates), Confectiones, Conservae, Decocta, Hierae (a class of complex purgative preparations of which an example still exists in Hiera Picra), Infusiones, Emplastra, Electuariae, Lenitiva (mild laxative confections) Locchi (syrupy preparations too thick to be poured), Olea, Oxymellitae, Pilulae, Pulveres, Syrupi, Sapones, Sinapisma, Species, Trochisci, Unguenta and Saccharata.

degree. He taught for twelve years at Wittenberg and then went to Italy to study and died in Rome in 1544 at the early age of twenty-nine.

While he was at Wittenburg he interested himself in the compilation of pharmaceutical formulas from various sources. Pharmacists in Saxony had heard of his hobby and had come to him for formulas which he furnished freely in manuscript form. On his way to Italy after leaving Wittenburg, he stopped off at Nuremberg.

There had already been an awakening in this center of culture and learning in connection with matters pharmaceutical, for the Senate of Nuremberg as early as 1529 had enacted a law which read as follows:

> "All the *Laxativa* such as *Electuaria* and *Pilulae* must be prepared and dispensed by the druggists in accordance with the book known as the *Luminare Majus*. . . . Each druggist will be furnished with a copy, by which he must be guided to the exclusion of all other formulas."

The *Luminare Majus* mentioned in this law was a receipt book compiled from Greek and Arabic sources by *Jacobus Manlius de Bosco* in Venice in 1546. There was also a *Luminare Minus* or *Lumen Apothecariorum* which *Quirinus de Augustus de Thertona* had compiled and published in Venice in 1494. These two works were very much out of date in comparison with the compilation of Valerius Cordus.

The fame of his pharmaceutical research having preceded him, the physicians of Nuremberg asked Cordus to furnish a copy for the local pharmacists. Valerius Cordus, wishing to have the official sanction of the Senate of the Free City of Nuremberg, turned over his complete manuscript to that body for examination and approval. The Senate tentatively accepted it with thanks and turned it over to a local committee of physicians for investigation.

The committee soon reported that in their opinion it was the most complete work of its kind that they had ever seen and required no alterations or corrections. The Senate immediately ordered it printed and upon its appearance, which was in 1546 two years after Cordus' death in Rome, directed all pharmacists to prepare their medicines according to its formulas.

The complete title of this work was *"Pharmacorum Conficiendorum Ratio, Vulgo Vocant Dispensatorium."*

The classes of preparations listed in the table of contents of this book is as follows: (The figures which follow are the number of formulas in each group.)

Confectiones Aromaticae 45.
Confectiones Opitae 28.
Condita 29—Semi-solid saccharine preparations made with plant juices and sugar.
Conservae 27—Preparations made with fruit pulp or flower petals preserved with sugar.
Lenitiva Et Solutiva 40—(Here were included certain laxative electuaries and confections, the Hieras, Powders, Species and Suppositories).
Pilulae 44.
Syrupi 60.
Rob 7—(Jellies made with fruit juice and sugar).
Lohoch 7.
Trochisci 30.
Emplastra 15.
Caerota 3.
Unguenta 23.
Olea 56.
Preparationes quorundam simplicum.
Table of adulterations and their detection.
Quid pro quo (an official list of authorized substitutes).

Upon studying this work in detail we find many facts of interest. Almost every formula is credited to its originator. We find the following names represented in this connection.

Galen	Avicenna
Cleopatra	Rhazes
Andromachus	Nicholas Prepositus
Damocrates	Nicholas Alexandrini
Mithridate	Nicholas Florentini
Aetius	Haly
Paulus Aeginata	Gabriel
Actuarius	Giulelmi de Varignana
Mesuae	Jacobus de Manlius

Here are nearly a score of authorities none less than a century old and many dating back more than a thousand years.

Many of the formulas, especially in the classes of confections are polypharmacal messes, few having less than a dozen ingredients and quite a number having more than fifty.

In the *confectiones opiatae* are always found one or more and sometimes all of the following drugs: opium, castor, hyoscyamus and mandragora.

The only official suppository was made of honey and salt moulded into the proper shape.

Among the pills we find pills of aloes and mastic and also pills of aloes and myrrh.

The "syrups" included many used as vehicles such as syrups of orange, lemon, apple, pomegranate, rose and violet.

In this class, too, were included honeys, oxymels, juleps (sweetened drinks) and mivas (the only miva was Miva Cydoniorum made from quince juice, wine and sugar).

Among the plasters we find lead plaster.

Among the cerates we find *Cerotum Infrigidans Galeni* (cold cream).

Among the ointments we find an apostolic ointment containing twelve ingredients, one for each apostle; also ointment of zinc oxide which is called *Unguentum Pompholigos.*

Under the heading of oils are fixed oils, volatile oils, empyreumatic oils and infused oils.

Among the curious ones in this list are Oil of Earthworms with earthworms, olive oil and wine; Oil of Bricks was made by saturating brick fragments with olive oil and subjecting them to destructive distillation; Oil of Egg Yolks was made by expression from hard boiled eggs; *Oleum Hyperici* was made by infusing St. Johnswort in fixed oil as it is made today; *Oleum Spicae* was made by distilling Spike Lavender; Oil of Sweet Almonds, Oil of Sesame and Olive Oil were all made by expression; Petroleum was described as varying in physical appearance from colorless to black.

There is a table of sources of simple remedies as for example vinegar which is directed to be made from wine and not from beer, nor honey and water.

In the *quid pro quo, aqua pluvia* may be replaced by *aqua fontana; asphalt* by *pix liquida; colocynth* by *semen ricini; mel* by *saccharum; oxyza farina* by *hordeum farina;* wool fat by deer marrow; cuttle fish by pumice, etc.

Taking it all in all this work of Valerius Cordus which is in a small pocket size format of nearly 500 pages has many features which are worthy of study and thought.

Chemical substances are notable by their omission for the most part as the influence of Paracelsus had not begun to be felt, and most surprising of all "Oleum Vitrioli Dulci," which was the name by

which ether was first known when discovered by *Valerius Cordus,* was not even mentioned in his book, probably because it took nearly 300 years to find a therapeutic use for it.

Although the work of Valerius Cordus was not actually called a pharmacopœia it is generally credited as being the first pharmacopœia in the real sense of the word. While this may not be literally true, it is certain that it had more influence on later pharmacopœias than the earlier works published in Florence and Barcelona and was actually republished for the use of other communities such as Lyons and Venice and was periodically revised for more than a century.

Another and slightly later work which shares close honors with that of Valerius Cordus in its influence upon subsequent pharmacopœias was that of Augsburg, first issued in 1564 under the unusual name of "Encheiridion."

The complete title of this work was *"Encheiridion sive ut vulgo vocant dispensatorium compositorum medicamentorum, pro Reipub. Augstburgensis Pharmacopeis."*

Indeed it would seem as though first honors should go to the Augsburg book because it was more carefully prepared than that of Valerius Cordus and continued over a longer period of time in more frequently issued editions, and ascribes formulas to a greater number of contemporary or then recently deceased authorities than had been done by Cordus. (1)

We now come to that greatest of all landmarks in the history of pharmacopœias, the *Pharmacopœia Londinensis.* Sponsored by the London College of Physicians which had been chartered by Henry VIII, the preliminary steps were taken in 1589 by the appointment of ten committees to carry out the work of compiling a pharmacopœia for Queen Elizabeth's realm.

The following is the list of subjects to be considered by these ten committees.

1. Syrups, Juleps and Decoctions.
2. Oils.
3. Waters.
4. Liniments, Ointments, Cerates and Plasters.
5. Juices, Conserves, Candies and Confections.

(1) The Augsburg "pharmacopœia" was the work of Adolph Occo III (1524-1606), who came from a distinguished line of German physicians of the Occo family, all of whom were named Adolph.

6. Extracts, Salts, Chemicals and Metallic Preparations.
7. Powders and Dragees.
8. Pills.
9. Electuaries, Opiates and Eclegmas.
10. Lozenges and Eye Salves.

These committees showed no extreme haste in their work for in 1615 long after the Virgin Queen had passed away the committee was resuscitated and eight additional Fellows were appointed to examine the several pharmacopœias which had appeared during the previous century, and which were then in extensive use in continental Europe, and two years later, in 1617, the first *Pharmacopœia Londinensis* appeared.

This was largely due to the interest and activity of Sir Theodore Turquet de Mayerne, who had been forced to leave France because of his boldness in administering the mineral remedies advocated by Paracelsus a century previously, and who had been welcomed by James I, who made Mayerne his chief personal physician.

Mayerne, whose name heads the list of Fellows who stood sponsor for this first edition, also wrote the preface for the book. The first edition was so full of errors that it was recalled and a corrected edition was issued within a year.

Compared with previous pharmacopœias this was a very comprehensive work. It contained 1028 simple drugs and 932 preparations and compounds.

The title page of the revised first edition which appeared in 1618, reads as follows:

Pharmacopœia Londinensis, in qua medicamenta antiqua et nova usitatissimo sedulo collecta accuratissime examinata, quotidiana experientia confirmata describuntur. Diligentur revisa, denuo recusa, emendiator auctor Opera Medicorum Collegii Londinensis. Ex serenissimi Regis mandato cum R. M. privelegio, 1618.

The copper plate engraved title page is very elaborate. It contains the British coat of arms, figures of Hippocrates, Galen, Mesue and Avicenna and inscriptions in Hebrew, Greek, French, Latin and English.

The list of Fellows given credit for having sponsored the book contains the name of "Gulielmus" Harvey, the discoverer of the circulation of the blood.

The classes of preparations are as follows:

Aquae Simpliciones
Aquae Compositae
Vina Medicata
Aceta
Decocta
Potio Vulneraria
Syrupi Simpliciones
Melita et Oxymelita
Rob sive Sapae et Succi
Lohock sive Eclegmata
Condita
Conservae et Sacchara
Species sive Pulveribus
Electuaria
Pilulae Purgantes
Pilulae Purgantes Fortior
Trochisci Alterantes sine Opio
Trochisci Alterantes cum Opio
Trochisci Purgantes
Olea Simplicia
  per expressionem
  per infusionem vel decoctionem
Olea Composita
Unguenta Simpliciona
Emplastra et Cerata
Olea Chymica (distilled)
  Ex herbis
  Ex semenibus
  Ex baccis
  Ex aromatibus
  Ex corticibus
  Ex lignis
  Ex fusilibus
  Ex gummi et resionis
  Ex mineralibus et lapidosus
Preparationes Chymicae Magis Usuales
Extractorum Conficiendorum Ratio
Salium ex Omni Genere Vegitabilum Conficiendorum Modus
Pondera et Mensurae
Medicamentorum quorundam preparationes pharmacopœias apprime necessariae
Quinque Flores Cordiales
Quinque Herbes Emollientes
Quatuor Semina Calida Maiora
Quatuor Semina Calida Minora
Quatuor Semina Frigida Maiora
Quatuor Semina Frigida Minora
Quinque Radices Communes Aperitiva
Simplicium
  Radices
  Cortices
  Ligna
  Folia
  Flores
  Fructus et Germina
  Semina sive grana
  Lachrimae
  Succi
  Plantarum Excrementa
  Animalia
  Animalia partes
  Animalia Excrementa et Opera
  Animalia Marina
  Sales
  Metallica

Comparing this comprehensive classification with those of the works of Valerius Cordus and Occo it will be seen that some great advances had been made.

It is especially noteworthy that besides quoting formulas from the old worthies whose names we have met before, there are many preparations ascribed to recent or contemporaneous authorities such as Mayerne, Mountford, Lang and Matthiolus, and we meet for the first time the names of Paracelsus and Cordus attached to formulas. References are also found to the pharmacopœias of Nuremberg and Augsburg.

Among the chemical preparations we find cream of tartar, crocus martis, flowers of sulphur, sal prunella, mercurius dulcis (calomel), mercurious vitae, and saccharum saturni (sugar of lead).

We also find directions for washing aloes, purifying clays, making unsalted butter, making calcium hydroxide, purifying iron filings, preparing coral and precious stones, collecting elaterium, preparing goats blood, young swallows, earthworms and millipedes, purifying wool fat, drying foxes lungs and drying scammony and squill.

Time and space do not permit the discussion of the simples, especially those from the animal kingdom some of which are particularly revolting, but we must remember that this was the age in which *everything* was believed to have medicinal value, and compared with some of the other formularies the committee did show some evidences of restraint, more so than was shown by committees who revised this book later during this same century.

The seventeenth and eighteenth centuries saw a flood of pharmacopœias. Some originated in cities as Paris, Antwerp, Brussels, Edinburgh, Dublin. Others in countries as Prussia, Saxony, Wirtemberg, Spain, etc. Still others were privately issued.

Among the more prominent of the latter were those of Renodaeus 1615, Quercetanus (Duchesne) 1619, Schroeder 1641, Poterius 1643, Zwelfer 1652, Charas 1676 and Lemery 1697.

A privately issued Antidotarium of Wecker which was first issued in 1574, went through two later editions in the seventeenth century in competition with the foregoing and many others.

The London Pharmacopœia itself brought expounders, translators and commentators in the persons of Culpepper and Salmon, each of whom brazenly called his book the *Pharmacopœia Londimensis,* and then proceeded to criticize that work.

Prominent English physicians were not averse to issuing or having issued their own collection of formulas under the name of a pharmacopœia, and so we have the pharmacopœias of Bates (Bateana), Fuller, Quincy, Radcliffe and Willis.

In America the first pharmacopœia issued was the one issued for the Continental Army during the Revolutionary War.

The complete title of this tiny volume which contained exactly 100 official substances was: *Pharmacopœia Simpliciorum et Efficaciorum in usum Noscomii Militaris ad Exercitum Foederatum Americae Civitatum Pertinentis. Hodiernae Nostrae Inopiae Rerumque Angustis. Feroci hostium saevitae, belloque crudeli ex inopinato patriea nostrae illato debitis.*

Translation:

PHARMACOPŒIA

Of Simples
And Efficients

SUITABLE FOR THE USE OF THE MILITARY HOSPITAL

TO THE ARMY

OF THE UNITED STATES OF AMERICA

Particularly adapted to our present distress and need which we owe to the savage cruelty of the enemy and to a cruel war brought unexpectedly upon our country

Maxine Accomodata Philadelphiae, ex officina Styner et Cist. MDCCLXXVIII, Lititz, Mar. 12, 1778.

Part one of this book, contained eighty-four *medicamenta interna* which included examples of the following classes.

Aquae	Infusa
Boli	Injectio
Collyria	Linimenta
Conserva	Magnesia
Decocta	Mucilagines
Electuariae	Olea
Elixiria	Pilulae
Enema	Pulveres
Epithema	Solutiones
Fotus	Tincturae
Gargarisma	Vina
Haustus	Syrupi

The second part contained sixteen examples of *medicamenta externa sex chirurgica,* among which were lead water, lunar caustic, copper sulphate, mercuric oxide, tincture of aloes and myrrh, lint, lead plaster, adhesive plaster, and a number of ointments.

The next and most important American pharmacopœia prior to the U. S. P. was the pharmacopœia of the Massachusetts Medical Society, printed in 1808 in Boston, and avowedly and frankly based upon the Edinburgh Pharmacopœia of which a revision had recently appeared.

This work like our first U. S. P. was divided into two parts.

The first part consisted entirely of simples of which 239 were defined without descriptions or tests of any kind.

Part II consisted of groups of preparations and compounds under the following headings:

1. Sulphur.
2. Acids, Alkalies, Earths and Compounds.
3. Metalline Preparations.
4. Ether and Ethereal Spirits.
5. Drying of Herbs and Flowers.
6. Expressed and Inspissated Juices.
7. Fixed Oils and Oily Preparations.
8. Distilled Waters and Spirits.
9. Volatile Oils.
10. Infusions and Decoctions.
11. Emulsions and Mucilages.
12. Syrups.
13. Medicated Vinegars.
14. Tinctures.
15. Medicated Wines.
16. Extracts.
17. Powders.
18. Conserves and Electuaries.
19. Troches.
20. Pills.
21. Liniments, Ointments, Cerates and Plasters.

There was a table showing the amounts of antimony, mercury and opium in the preparations of these substances, a posological and prosodial table, tables of ancient names and synonyms, and separate indexes in Latin and in English.

The last link in the chain was a local pharmacopœia, issued by the New York Hospital in 1816 under the title, *Pharmacopœia Noscomii Neo Eboracensis,* which had a local use, but which emphasized the need for a national book of standards.

We have now come to the end of a long and interesting trail, which merges into the highway of U. S. P. revision which we are traveling at present.

How far we have come and what progress we have made is evident even to a casual observer who compares our present U. S. P. with some of those whose outlines have been given in more or less detail.

Each age has had its own problems to solve and each century has shown some improvement.

May we accept our responsibilities and fulfill our opportunities and duties in the same conscientious spirit that was manifested by our predecessors in medicine and pharmacy.

ABSTRACTS FROM AND REVIEWS OF THE LITERATURE OF THE SCIENCES SUPPORTING PUBLIC HEALTH

Hydrogenated Fats in the Preparation of Ointment Bases for Tropical Countries. A. F. Caldwell. *Quarterly Journal of Pharm. and Pharmacol. 12,* 689 (1939). An investigation was carried out to determine hydrogenated fats to replace lard and suet in ointment bases suitable for use in tropical countries at temperatures of 29° to 30° C. and a high humidity. Such ointment bases must remain of a viscosity that will prevent separation of any suspended solid. Animal fats rapidly become rancid under these environmental conditions.

The first of two groups of ointment bases, the non-absorbent bases, includes the following:

Yellow petrolatum	Melting point 30°-46° C.
White petrolatum	Melting point 40°-46° C.
Hard paraffin	Melting point 50°-60° C.
White beeswax	Melting point 62°-64° C.
Yellow beeswax	Melting point 62°-64° C.

These are employed for their surface protective action. Hard paraffin acts as a hardening agent for the petrolatum. Beeswax acts as an emulsifying and hardening agent.

The second class, the absorbent bases, are employed when the medicament is to be absorbed. This class includes animal fats, waxes and vegetable oils, of which the following are the more important:

1. Prepared lard	Melting point 30°-41° C. Iodine value 52-66 Acid value 1.2
2. Benzoinated lard	———
3. Suet	Melting point 45°-50° C. Iodine value 33-46 Acid value 2
4. Benzoinated suet	———
5. Wool fat	Melting point 34°-40° C. Iodine value 18-32 Acid value 1

Moisture, temperature and presence of oxygen are important factors in the development of rancidity. Those fats having a high iodine value, being less saturated, tend to become rancid more rapidly than those with low iodine values. In rancidity, oxidation occurs at the double bonds of the formulae with the production of peroxides, followed by aldehyes and ketones, and hydrolysis, with the production of acids of lower molecular weight. Rancid fats contain irritating substances. This makes them unsuitable for use in ointments. Hydrogenated fats are more saturated than the original oils and should be less subject to rancidity.

Lard, widely employed as an absorbent base, has three disadvantages:

1. The melting point varies considerably, and its physical condition is too soft for use in tropical countries.
2. The Mohammedan countries have religious objections to its use.
3. Lard more quickly becomes rancid than most other fats. Benzoin serves to retard the rancidity but does not prevent it.

Suet, as it is more stable, may be substituted for lard either with or without benzoin. The disadvantage of suet lies in the fact that it produces granular ointments.

Wool fat possesses excellent absorptive properties and is a valuable emulsifying agent. Its tenacious consistency and characteristic odor render it unsuitable to be used alone as a general base. Cold cream is not satisfactory due to its instability when made with vegetable oils and its reduced absorbent properties when made with liquid or soft petrolatum.

Seven samples of hydrogenated fats with a melting point range of 30°-80° C. were investigated to determine the physical and chemical constants, peroxide compound content and comparative costs.

Contradictory evidence exists regarding drug absorption by the skin from solution in fats, oils or alcohol. Emollient substances are believed to render the skin softer and more elastic. This is due to surface layer penetration influenced by the slight congestion produced by rubbing in application. The ingredients are in contact with and may be absorbed by duct-lining cells of the sweat glands and the hair follicles. Lipoid solvents permit absorption of drugs; aqueous solu-

tions do not. Fiero stated that hydrogenated fat is absorbed as readily as lard; the addition of wool fat increasing the absorption. Cocoanut oil is readily absorbed but its low 22°-23° C. melting point prevents its use in tropical countries.

The author concluded that hydrogenated palm kernel oil (M. P. 40°-42° C.) is a suitable substitute (for lard and suet) in ointments for use in tropical countries; with the melting point altered by the degree of hydrogenation. The oil shows little tendency to rancidity. The author suggests hydrogenated palm kernel oil combined with 12.5 per cent. soft petrolatum (for smoother consistency) as a suitable ointment base for absorption or penetration use. This base was satisfactorily used in:

Unguentum Sulphuris	B. P.
Unguentum Zinci	B. P.
Unguentum Gallae	B. P. C.
Unguentum Aquosum	B. P.
Unguentum Chaulmoograe	(10%)
Whitfield's Ointment	
Unguentum Acidi Salicylici cum Sulphure	
Salicylic Acid	gr. X
Sublimed Sulphur	gr. XV
Base qs ad	℥i
Unguentum Iodi Denigrescens	
Iodine	5 Gm.
Arachis Oil	15 cc.
Hydrogenated Castor Oil (M. P. 60° C.)	10 Gm.
Palm Kernel Oil Base qs ad	100 Gm.

Mix the iodine with the arachis oil, warming slightly, and set aside for two hours until combination is complete. Then add other ingredients.

The author, working at the request of the British Pharmacopoeia Commission, concludes with suggestions for further work.

M. O. H.

Carotene Therapy of Grip. Through *J. A. M. A. 114,* 290 (1940). Pure crystalline carotene was used in 0.5 per cent. solution

dissolved in sunflower seed oil. It was administered by inhalation and by intranasal instillation to 226 patients with grip. Patients with acute catarrhal manifestations such as cough, running nose, hyperemia of the nose, bronchitis, headache, etc., were selected for observation. Inhalations were given for from five to ten minutes once or twice daily depending upon the severity of the case. Intranasal medication consisted of instilling four or five drops once or twice a day. A control group was treated by the customary treatment, e. g., salicylates internally and intranasal use of epinephrine, menthol, etc.

In the group treated with carotene 90 per cent. recovered within three days, whereas in the control group seven days were required for the same number of recoveries. In many instances definite relief was observed after the first treatment.

Follow-up studies showed that with 105 cases treated with carotene only six cases experienced a recurrence within a month. In the control group there were twenty-six recurrences of grip and eight of pneumonia in a total of ninety-two cases. The local carotene therapy by the intranasal method appears to exert a desirable effect on inflamed mucosa while the inhalation method also renders the provitamin available to all organs of the body. L. F. T.

The Control of Impetigo in the Hospital. R. G. Flood. *Hospitals 14,* 110 (1940). The author considers impetigo to be spread primarily by the attendants' hands during the handling of the new-born infants. In order to overcome this the nurses at St. Mary's Hospital (San Francisco) are required to plunge their scrubbed hands in a solution containing 1 per cent. iodine and 1.5 per cent. potassium iodide, count to ten and then rinse in a saturated solution of sodium thiosulfate for about five seconds to remove the brown stain. The infants may then be handled with wet hands. The solutions are changed every six hours but the cost is only 14½ cents per liter. Using this technic, almost no cases of impetigo among the infants have been observed. L. F. T.

Histaminase in the Treatment of Cold Allergy. T. W. Baker. *J. A. M. A. 114,* 1059 (1940). For several years the interesting phenomena exhibited by persons suffering from cold allergy have been studied by several workers. It has been shown that the systemic reactions, blood pressure, pulse rate, etc., of such persons when ex-

posed to cold are in every way comparable to the symptoms experienced by persons who have received injections of histamine hydrochloride. They have concluded that physical agents such as cold probably cause increased permeability of the tissue cells and permit the release of histamine, which is a normal constituent of the skin and other organs, thereby causing the reactions in the patients exhibiting hypersensitivity to cold.

In 1931 Best and McHenry demonstrated that histamine was destroyed in the body by an enzyme called histaminase. This enzyme was found to be present in relatively large amounts in the wall of the large and small intestine and in moderate amounts in many other organs.

It is now available commercially and it is being employed in the treatment of several conditions of an allergic nature, thus it has given excellent results in treating serum sickness, allergic reaction to insulin, etc.

The author reports its successful use in the treatment of cold allergy and suggests its more extensive use particularly in allergic diseases and especially those in which urticaria is a prominent feature.

L. F. T.

Karaya Gum Hypersensitivity. K. D. Figley. *J. A. M. A. 114,* 747 (1940). S. S. Bullen first called attention to karaya gum as an allergen in reporting a case of perennial hay fever from this substance. The patient was a woman and the source of the gum was the wave-set material used on her hair.

The author calls attention to a series of sixteen cases under his observation arising from this commonly used substance. All the cases were among women.

Skin tests are readily performed by the scratch method using the moistened gum powder or a drop of any of the suspected wave set material. Intracutaneous test material can be made by dissolving a few granules of the gum in buffered saline solution and then sterilizing through a Seitz filter.

In addition to inhalation of the gum from the flaking of dried wave set material, symptoms may also be caused by ingestion. Since karaya gum is also employed in many supposedly harmless laxatives care should be taken in using such preparation in persons susceptible to allergic sensitization.

L. F. T.

BOOK REVIEW

Done by persons, unafraid to upbraid, but perfectly willing to give praise where praise is really due.

Textbook of Physiology. By William D. Zoethout, Professor of Physiology in the Chicago College of Dental Surgery. 7th edition, 1940. C. V. Mosby Co. $4.50.

In reviewing the sixth edition of this book (American Journal of Pharmacy, August, 1938) we pointed out the commendable clarity of style and the excellence—both in number and character—of the illustrations. The present volume is some thirty pages longer and contains several new illustrations. We can heartily recommend this work to any pharmacist who wishes to acquire a better comprehension of the operation of the human body.

H. C. Wood.